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ENVIRONMENTAL MANAGEMENT
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**INFORMATION
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**ROCKY FLATS ENVIRONMENTAL
TECHNOLOGY SITE**

**EMD OPERATING
PROCEDURES MANUAL
VOL I: FIELD OPERATIONS**

Manual No.: 5-21000-OPS-FO
New Manual No.: 4-11000-ER-OPS-FO
Procedure No.: Table of Contents, Rev 75
Page: 1 of 3
Effective Date: 11/15/94
Organization: Environmental Management

THIS IS ONE VOLUME OF A SIX VOLUME SET WHICH INCLUDES:

**VOLUME I: FIELD OPERATIONS (FO)
VOLUME II: GROUNDWATER (GW)
VOLUME III: GEOTECHNICAL (GT)
VOLUME IV: SURFACE WATER (SW)
VOLUME V: ECOLOGY (EE)
VOLUME VI: AIR (AP)**

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94-DMR-001010	LIMITED SCOPE Section FO.03 Text Modification	2	06/01/94
94-DMR-001224	Equipment Decontamination Location Adjustment	2	07/15/94
FO.04	Heavy Equipment Decontamination	2	05/12/92
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FO.07	Handling of Decontamination Water and Wash Water	2	05/12/92
94-DMR-001175	LIMITED SCOPE - Decontamination Water Disposal Location Changes	2	06/20/94

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94-DMR-000148	Section FO.23 Modifications	0	02/09/94
94-DMR-001108	Buried Instrumentation and Existing Soil	0	06/14/94
94-DMR-001350	Various Text Additions and Deletions Regarding Drums and Use of SOP FO.29	0	08/16/94
FO.25	4-B11-ER-OPS-FO.25 Shipment of Radioactive Materials Samples	0	12/01/93
FO.27	4-BO1-ER-OPS-FO.27 Collection of Floor/Equipment Hot Water Rinsate Samples	0	07/26/93
FO.29	4-H46-ENV-OPS-FO.29 Disposition of Soil and Sediment Investigation-Derived Materials	0	06/24/94
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FO.30	4-I11-ER-OPS-FO.30 Environmental Restoration Program Division Equipment Operation	0	10/07/94
FO.32	4-I50-ENV-OPS-FO.32 Treated Effluent Discharge Operable Unit 1, Building 891	0	04/13/94
•FO.35	4-I53-ENV-OPS-FO.35 Ultraviolet/Hydrogen Peroxide Oxidation System - Normal Operations OU1, Building 891	0	11/15/94

Rocky Flats Environmental Technology Site

4-I53-ENV-OPS-FO.35

REVISION 0

ULTRAVIOLET/HYDROGEN PEROXIDE OXIDATION SYSTEM—NORMAL OPERATIONS OPERABLE UNIT 1, BUILDING 891

APPROVED BY:

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Operable Unit 1 Closure
Industrial Hygiene
Occupational Safety
Radiological Health and Engineering
Surface Water Division

USE CATEGORY 3

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1. PURPOSE

This procedure provides operating instructions for the Ultraviolet/ Hydrogen Peroxide (UV/H₂O₂) oxidation system at the Rocky Flats Plant Building 891 Groundwater Treatment Facility for the 881 Hillside, Operable Unit (OU) 1.

2. SCOPE

This procedure applies to all Environmental Operations Management employees and subcontractors.

This procedure addresses normal operations of the UV/H₂O₂ oxidation system.

3. OVERVIEW

The Building 891 Groundwater Treatment Facility consists of :

- A groundwater recovery and storage system.
- A UV/H₂O₂ oxidation system.
- An ion exchange system with units for acid and caustic regeneration of resin.
- A spent regenerant neutralization system.
- A treated effluent storage and discharge system.

A simplified diagram of the system is shown in Appendix 1, Groundwater Recovery/Storage System Diagram. A list of valve designators, nomenclature, and types are provided in Appendix 2, Valves.

A UV/H₂O₂ oxidation process is the first step in removing groundwater contaminants. The UV/H₂O₂ oxidation process oxidizes the organic constituents using 50% H₂O₂, which is a strong oxidizer, and UV light. The UV light catalyzes the oxidation by converting the peroxide to a hydroxyl radical, thus making it a more effective oxidant. Effluent from the UV/H₂O₂ process flows to ion exchange surge Tank T-203, which is identical to influent equalization tanks T-201 and T-202. The purpose of the surge tank is to receive and store the water until it is pumped out to the ion exchange process.

The PSI Perox-Pure™ Organic Destruction Process Model CWB 240/360 UV/H₂O₂ treatment system is designed to treat up to 30 gpm of groundwater from the 881 Hillside, OU 1. The treatment system consists of two 340-gal stainless steel reactors, each containing eight UV lamps, and power and control panels on a single skid. Feed pumps, a flowmeter, pressure gauges, and temperature gauges are included as part of the UV/H₂O₂ unit. A skid-mounted H₂O₂ feed module consisting of a 500-gal tank and two metering pumps is also provided as part of the UV/H₂O₂ unit.

3. OVERVIEW (continued)

The Perox-Pure™ treatment system design operating conditions are as follows:

- Process flow rate is 10 to 30 gpm
- Process temperature is 117 to 160 °F
- Operating pressure is 3 to 15 psig, protected by a rupture disc rated at 15 psig
- Power requirement is 240 kW

The 16 UV lamps are normally operated when the influent flow rate is 30 gpm. If the flow rate decreases, the number of UV lamps operating are manually decreased to prevent the water in the oxidation chamber from overheating and causing the system to shut down automatically. The number of UV lamps may also be reduced based on influent organic contaminant concentrations to conserve energy. Historical experience with the waste encountered at OU 1 indicates that eight UV lamps are adequate to reduce the organic contaminants present to less than detectable limits. The shutdown temperature is manually controlled, and the system shuts down at 150 °F, which is the maximum allowable temperature for the ion exchange surge tank. At a flow rate of 10 gpm and 20 gpm, 6 and 11 lamps are operated, respectively. Fewer lamps may be used if it is determined that volatile organic destruction is achieved.

Under automatic operation, the UV/H₂O₂ unit takes untreated water from influent equalization tank T-201 or T-202, which contain water pumped from the groundwater recovery system. In addition to treating groundwater from the influent storage tanks, water stored in the following three 150,000-gal effluent tanks can also be recirculated to the UV/H₂O₂ system for additional treatment as described in 4-I51-ENV-OPS-FO.33, Treated Effluent Recirculation, Operable Unit 1, Building 891:

- Tank T-205
- Tank T-206
- Tank T-207

A centrifugal splitter pump is installed on the UV/H₂O₂ unit to dilute and split the peroxide feed to three points on the UV reactors. Water for dilution is provided by taking a small side stream of treated water, approximately 1 gpm, from a pipe tee at the UV/H₂O₂ unit effluent outlet and directing it to the splitter pump inlet. Three rotameters are located inside a panel on the south of the drive enclosure which indicate the amount of peroxide solution flow to each injection point. The splitter is set initially at the following flows for each chamber for a total flow of 1.9 gpm:

- No. 1 Splitter, 1.0 gpm
- No. 2 Splitter, 0.6 gpm
- No. 3 Splitter, 0.3 gpm

4. RESPONSIBILITIES

4.1 Operator

Operates the UV/H₂O₂ oxidation system.

4.2 Project Manager

Ensures that project personnel are properly trained, and that the training is documented.

Ensures that project records are handled appropriately.

5. LIMITATIONS AND PRECAUTIONS

- Only one UV/H₂O₂ feed pump, P-301 or P-302, may be operated at a time. If both pumps are selected, neither will operate.
- Lamp ammeter readings greater than 8 amps indicate that the lamp surface may be touching a quartz tube. In this case, the UV/H₂O₂ oxidation system shall be shut down and allowed to cool. The lamp shall then be rotated 180 degrees in the tube.
- H₂O₂ is a strong oxidizer. Proper safety precautions as described in the Rocky Flats Plant OU 1 Groundwater Treatment Facility Health and Safety Plan shall be taken by operations personnel when handling H₂O₂.

6. PREREQUISITES

6.1 Planning and Coordination

Project Manager

- [1] Ensure that all personnel involved in the implementation of this procedure have the appropriate health and safety training as specified in the Rocky Flats Plant Operable Unit 1 Groundwater Treatment Facility Health and Safety Plan.
- [2] Document personnel training related to this procedure in the project files in accordance with 3-21000-ADM-02.01, Personnel Training.

7. INSTRUCTIONS

The section provides instructions for automatic operation.

Operator

- [1] Open HVB-201, Effluent From T-201 or HVB-202, Effluent From T-202, at appropriate influent storage tank T-201 or T-202.
- [2] Open V-75, UV Basket Strainer Influent.
- [3] Open one set of pump isolation valves for the selected feed pump:
 - [A] For P-301, open HVA-301, P-301 Inlet and HVB-301, P-301 Outlet.
 - [B] For P-302, open HVA-302, P-302 Inlet and HVB-302, P-302 Outlet.
- [4] Ensure that the following valves are CLOSED:
 - V-74, UV Influent Camlock
 - V-76, Basket Strainer Camlock
 - V-77, P-301, P-302 Effluent Camlock
- [5] Close the following valves:
 - V-80, Gamma Detection Isolation
 - HV-501, Recirculation to UV
 - HV-502, Recirculation to IX
 - HV-503, Recirculation
- [6] Open HVA-203, UV Effluent to T-203 and FCV-4, UV Influent Control.
- [7] Ensure that the UV/PEROXIDE TREATMENT UNIT breaker, UCP-2 is ON.

The breaker is on the west wall in the Building 891 electrical room.
- [8] Place the UV/H₂O₂ local disconnect switches DISC UCP-2-1 and DISC UCP-2-2 in ON.

The disconnect switches are on the wall directly east of the UV/H₂O₂ system.
- [9] Place breakers PDP UCP 2-1 and PDP UCP 2-2 in ON.

The breakers are in the UV breaker panels adjacent to the UV/H₂O₂ control panel.

NOTE: *Either PEROXIDE FEED SYSTEM PUMP 1 or PEROXIDE FEED SYSTEM PUMP 2 switch can be used for operation.*

- [10] Turn the selector switch for one Peroxide Feed System Pump on the H₂O₂ module to ON.

7. INSTRUCTIONS (continued)

Operator (continued)

- [11] Ensure that the other Peroxide Feed System Pump switch is OFF.
- [12] Open V-82, H₂O₂ Outlet.
- [13] Open one set of H₂O₂ Pump isolation valves:
 - [A] For H₂O₂ P-1, open V-84, H₂O₂ P-1 Influent and V-88, H₂O₂ P-1 Effluent.
 - [B] For H₂O₂ P-2, open V-85, H₂O₂ P-2 Influent and V-90, H₂O₂ P-2 Effluent.
- [14] Turn the SPLITTER PUMP selector switch on the UV panel to ON.
- [15] Ensure that V-91, H₂O₂ Splitter Pump Influent is OPEN.
- [16] Ensure that the following valves are open:
 - V-111, Inlet H₂O₂ Rotameter 1
 - V-112, Inlet H₂O₂ Rotameter 2
 - V-113, Inlet H₂O₂ Rotameter 3
 - V-114, Outlet H₂O₂ Rotameter 1
 - V-115, Outlet H₂O₂ Rotameter 2
 - V-116, Outlet H₂O₂ Rotameter 3

NOTE *If both pumps are selected, neither will operate.*

- [17] Place P 301 or P 302 selector switch in AUTO for the pump selected in Step [3].

- [A] Ensure that the other pump selector switch is OFF.

NOTE 1 *The control power switch is spring-loaded, and returns to the original vertical position when released.*

NOTE 2 *The feed pump selected in Step [17] starts when the main control power switch is placed in START.*

- [18] Turn the CONTROL POWER switch on the UV control panel to START.
- [19] Adjust FCV-4 to establish the desired feed rate of 30 gpm for normal operations.
- [20] Monitor the feed rate at the flowmeter in the UV control panel.
- [21] Ensure that CHAMBER #1 and CHAMBER #2 are to ON position.

7. INSTRUCTIONS (continued)

Operator (continued)

[22] Turn the lamp control switches for Chambers 1 and 2 on the UV control panel to ON.

[23] Turn each lamp switch in the UV control panel to ON.

The lamps start automatically in groups of three. Time delays are set for each group to prevent all of the lamps from lighting at once. Ammeters in the UV control panel indicate in the range of 7 to 8 amps when each lamp is operating properly.

NOTE *If the indicated current for a lamp exceed 8 amps, the lamp surface may be touching a quartz tube.*

[24] Monitor UV Panel current by selecting the preferred chamber with the A METER SELECTOR CHAMBER #1, #2 switch.

[25] **IF** the current for a lamp exceeds 8 amps,
THEN:

[A] Turn off the UV system by placing the Control Power switch in OFF.

[B] Allow the lamps to cool.

[a] Monitor UV Effluent temperature gauge until it indicates 90 °F, or less.

NOTE: *Only lamps that have current readings greater than 8 amps require rotation.*

[C] Rotate the lamp 180 degrees in the tube.

[a] Open the enclosure doors to the chambers.

[b] Remove the bolts on the lamp end brackets.

[c] Remove the lamp end brackets.

[d] Rotate the lamp in the tube with an open end or adjustable wrench.

[e] Install the lamp end brackets.

[f] Install the bolts on the lamp end brackets.

[g] Close the enclosure doors to the chambers.

[D] Energize the UV system by placing the CONTROL POWER switch in START.

7. INSTRUCTIONS (continued)

Operator (continued)

[E] Turn the peroxide module switch on the UV control panel to ON.

[26] Record H_2O_2 level in the burette mounted at the H_2O_2 module every hour in the Building 891 UV/ H_2O_2 Treatment Log. The correct rate is on Appendix 3, Peroxide Dosing Chart for Use with 50% H_2O_2 .

[27] Adjust the pumping rate by increasing or decreasing the peroxide metering pump speed or stroke in accordance with the LMI Metering Pump Manual.

The LMI Metering Pump Manual is provided with the Peroxidation Systems, Inc. Operation and Instruction Manual, and is in the Building 891 office.

NOTE *Proper personal protective equipment is identified in the Rocky Flats Plant OU 1 Groundwater Treatment Facility Health and Safety Plan.*

[28] **IF** the peroxide system feed pump is air-bound as evidenced by no flow of peroxide from the burette,
THEN release the air by pulling out the air release buttons at the peroxide system feed pump discharge.

[29] Open the splitter pump rotameter panel to observe the peroxide solution dose to each injection point.

[30] Adjust the H_2O_2 rate using the following manual control valves in the rotameter panel so that the indicated dose is achieved:

[A] For Rotameter No. 1, adjust V-111 for a dose of 1 mg/l.

[B] For Rotameter No. 2, adjust V-112 for a dose 0.6 mg/l.

[C] For Rotameter No. 3, adjust V-113 for a dose of 0.3 mg/l.

[31] Measure the residual peroxide in the effluent every 2 hr using peroxide Quant strips.

[A] Draw a sample from Sample Port 5.

[B] Measure the residual peroxide using Quant strips.

[C] Record the results in the Daily Log.

[D] Dispose of the sample in the building sump.

7. INSTRUCTIONS (continued)

Operator (continued)

- [32] Increase or decrease the peroxide flow to the third injection point to maintain approximately 1 to 3 mg/l residual.

[A] Adjust V-113.

- [33] Monitor the UV/H₂O₂ oxidation system hourly and record in Appendix 4, Building 891 UV/H₂O₂ Treatment Log, and the Daily Log.

When the level in T-203 reaches 7.7 ft, the UV/H₂O₂ oxidation system automatically shuts off. The UV/H₂O₂ oxidation system may be manually restarted when the level in T-203 is 7.2 ft or less.

- [34] **IF** an alarm occurs on the UV/H₂O₂ Control Panel,
THEN check system status and notify the project manager.

The system automatically shuts down on the following conditions:

- Low Water Flow
- Low Peroxide Pressure
- Lamp End Enclosure Moisture
- Lamp End Enclosure Door Open
- Overpressure Relief Flow
- Lamp Drive Enclosure High Temperature
- High Water Temperature in Oxidation Chamber
- Influent Tank Low Water Level
- Effluent Tank Low Water Level

NOTE *The main control power switch is spring-loaded, and returns to the original vertical position when released.*

- [35] **WHEN** the UV/H₂O₂ oxidation system is to be shut off manually,
THEN turn the CONTROL POWER switch on the UV control panel to OFF.

7. INSTRUCTIONS (continued)

Operator (continued)

[36] Close the following valves:

- HVB-201 or HVB 202
- V-75
- HVA-301 or HVA-302
- HVA-203
- V-91
- V-111
- V-112
- V-113
- V-114
- V-115
- V-116

8. RECORDS

Management of all records is consistent with 1-77000-RM-001, Records Management Guidance for Records Sources.

The log generated as a result of this procedure is considered a quality record, and is managed in accordance with 2-G18-ER-ADM-17.01, Quality Assurance Records Management.

This record is part of the Administrative Record, and is managed in accordance with 3-21000-ADM-17.02, Administrative Records Screening and Processing in addition to 2-G18-ER-ADM-17.01.

There are no nonquality records generated by this procedure.

Project Manager

- [1] Submit the Building 891 UV/H₂O₂ Treatment Log for management in accordance with 3-21000-ADM-17.02 and 2-G18-ER-ADM-17.01.

9. REFERENCES

LMI Metering Pump Manual

Peroxidation Systems, Inc. Operation and Instruction Manual

Rocky Flats Plant Operable Unit 1 Groundwater Treatment Facility Health and Safety Plan

1-77000-RM-001, Records Management Guidance for Records Sources

3-21000-ADM-02.01, Personnel Training

9. **References (continued)**

2-G18-ER-ADM-17.01, Quality Assurance Records Management

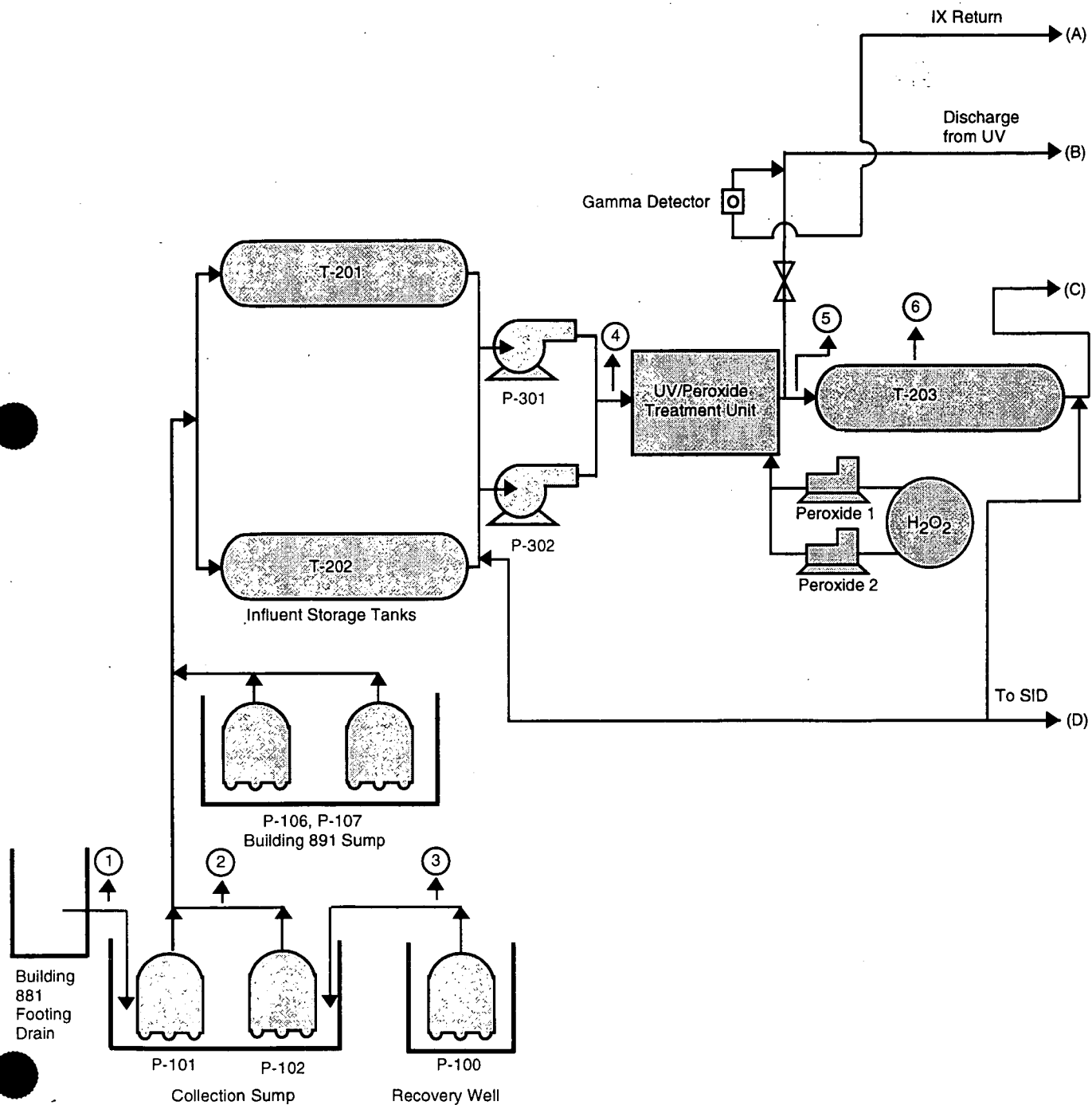
3-21000-ADM-17.02, Administrative Records Screening and Processing

4-I51-ENV-OPS-FO.33, Treated Effluent Recirculation, Operable Unit 1, Building 891

APPENDIX 1

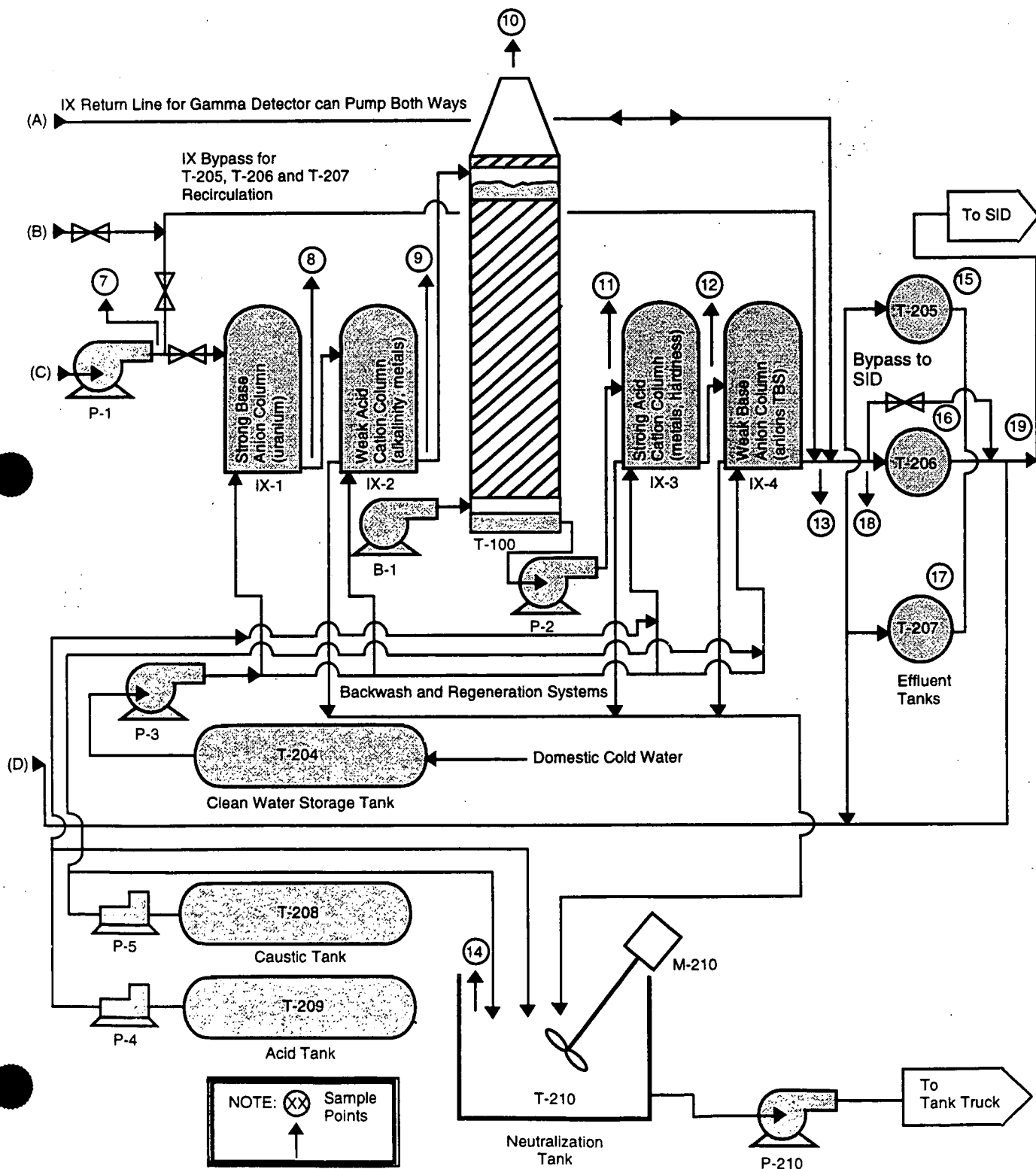
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GROUNDWATER RECOVERY/STORAGE SYSTEM DIAGRAM



APPENDIX 1

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APPENDIX 2

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VALVES

VALVE NO.	DESCRIPTION	TYPE
V-1	P-1 Service Inlet	2-in. Ball
V-2	P-1 Service Outlet	2-in. Ball
V-3	Bag Filter Outlet	2-in. Ball
V-4	IX-1 Inlet Isolation	1 1/2-in. Ball
V-5	IX-1 Outlet Isolation	1 1/2-in. Ball
V-6	IX-2 Inlet Isolation	1 1/2-in. Ball
V-7	IX-2 Outlet Isolation	1 1/2-in. Ball
V-8	Degasifier Inlet Isolation	1 1/2-in. Ball
V-9	Degasifier Outlet/P-2 Inlet	1 1/2-in. Ball
V-10	P-2 Outlet	1 1/2-in. Ball
V-11	IX-3 Inlet Isolation	1 1/2-in. Ball
V-12	IX-3 Outlet Isolation	1 1/2-in. Ball
V-13	IX-4 Inlet Isolation	1 1/2-in. Ball
V-14	UV #2 Sample Port	1/2-in. Ball
V-15	P-3 Inlet	2-in. Ball
V-16	P-3 Outlet	3-in. Ball
V-17	IX-2 Subsurface Backwash Inlet	2-in. Ball
V-18	IX-1 Subsurface Backwash Inlet	2-in. Ball
V-19	IX-3 Subsurface Backwash Inlet	2-in. Ball
V-20	IX-4 Subsurface Backwash Inlet	2-in. Ball
V-21	Bag Filter #2 Inlet	2-in. Ball
V-22	Bag Filter #2 Outlet	2-in. Ball
V-23	Caustic Makeup Water	1-in. Ball
V-24	Acid Makeup Water	1-in. Ball
V-25	P-5 to T-210 Influent	1 1/2-in. Ball
V-26	P-4 to T-210 Influent	1 1/2-in. Ball
V-27	P-5 Service Outlet	3/4-in. Ball
V-28	P-4 Service Outlet	3/4-in. Ball
V-29	P-5 Service Inlet	3/4-in. Ball
V-30	P-4 Service Inlet	1-in. Ball
V-31	T-208 Outlet	3/4-in. Ball
V-32	T-209 Outlet	1-in. Ball
V-33	BLR-2 Outlet	1 1/2-in. Ball
V-34	Degasifier Drain	1-in. Ball
V-35	Bag Filter 2 Drain	1/2-in. Ball

APPENDIX 2

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VALVE NO.	DESCRIPTION	TYPE
V-36	Bag Filter 1 Drain	1/2-in. Ball
V-37	P-5 Caustic Sample Port	1/4-in. Ball
V-38	P-4 Acid Sample Port	1/4-in. Ball
V-39	IX-2 Effluent Sample Port	3/4-in. Ball
V-40	IX-1 Effluent Sample Port	3/4-in. Ball
V-41	IX-3 Sample Port	3/4-in. Ball
V-42	IX-4 Sample Port	3/4-in. Ball
V-43	IX-2 Vent	3/4-in. Ball
V-44	IX-1 Vent	3/4-in. Ball
V-45	IX-3 Vent	3/4-in. Ball
V-46	IX-4 Vent	3/4-in. Ball
V-47	IX-2 Acid Regenerant	1 1/2-in. Ball
V-48	IX-3 Acid Regenerant	1 1/2-in. Ball
V-49	IX-4 Caustic Regenerant	1 1/2-in. Ball
V-50	P-100 Outlet	1 1/2-in. Ball
V-51	P-101 Outlet	1-in. Ball
V-52	P-102 Outlet	1-in. Ball
V-53	Collection Gallery Filter Inlet	2-in. Ball
V-54	Collection Gallery Filter Bypass	2-in. Ball
V-55	Collection Gallery Filter Outlet	2-in. Ball
V-56	P-101, P102 Effluent	2-in. Ball
V-57	T-201, T-202 Influent	2-in. Ball
V-58	Domestic Influent Backflow Preventor	2-in. Ball
V-59	Domestic Influent Backflow Preventor	2-in. Ball
V-61	T-201 Secondary Containment Purge	2-in. Ball
V-62	T-202 Secondary Containment Purge	2-in. Ball
V-63	UV Influent T-201, T-202 Secondary Containment Purge	2-in. Ball
V-64	UV Influent T-201 Secondary Containment Purge	2-in. Ball
V-65	Caustic Dilution Water Flow Control	3/4-in. Gate
V-66	Acid Dilution Water Flow Control	3/4-in. Gate
V-67	Caustic Pressure	2-in. Ball
V-68	Acid Pressure	2-in. Ball
V-69	UV Effluent T-203 Secondary Containment Purge	2-in. Ball
V-70	T-204 Secondary Containment Purge	2-in. Ball
V-71	Chemical Metering Isolation	3/4-in. Ball
V-72	Chemical Metering Isolation	3/4-in. Ball
V-73	T-201 and T-202 Secondary Containment Purge	2-in. Ball

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VALVE NO.	DESCRIPTION	TYPE
V-74	UV Effluent Camlock	2-in. Ball
V-75	UV Basket Strainer Influent	2-in. Ball
V-76	Basket Strainer Camlock	2-in. Ball
V-77	P-301, P-302 Effluent Camlock	2-in. Ball
V-78	UV Influent Sample Port	1/2-in. Ball
V-79	UV #1 Effluent Sample Port	1/2-in. Ball
V-80	Gamma Detection Isolation	2-in. Ball
V-81	H ₂ O ₂ Tank Sample Port	1/2-in. Ball
V-82	H ₂ O ₂ Outlet	1/4-in. Ball
V-83	Chemical Metering Isolation	3/4-in. Ball
V-84	H ₂ O ₂ P-1 Influent	1/4-in. Ball
V-85	H ₂ O ₂ P-2 Influent	1/4-in. Ball
V-86	T-209 Influent Line Sample Port	1/4-in. Ball
V-87	T-208 Influent Line Sample Port	1/4-in. Ball
V-88	H ₂ O ₂ P-1 Effluent	1/4-in. Ball
V-89	Air Scour Unloader	1 1/2-in. Butterfly
V-90	H ₂ O ₂ P-2 Effluent	1/4-in. Ball
V-91	H ₂ O ₂ Splitter Pump Influent	1/2-in. Ball
V-92	Splitter Pump Purge	1/2-in. Ball
V-93	UV Chamber #1 Effluent Pressure	1/2-in. Ball
V-94	IX-4 Effluent	1 1/2-in. Ball
V-95	Plant Effluent	2-in. Ball
V-96	Plant Effluent Sample Port	1-in. Ball
V-97	T-210 Purge Port	1/2-in. Ball
V-98	T-210 Sightglass	2-in. Ball
V-99	P-210 Effluent Isolation	2-in. Ball
V-100	P-210 Discharge Isolation	2-in. Ball
V-101	T-210 Effluent Bypass	2-in. Ball
V-102	Influent Secondary Containment Purge	2-in. Ball
V-103	Truck Dock Influent	2-in. Ball
V-104	Truck Dock Influent Secondary Containment Purge	2-in. Ball
V-105	Influent Line Secondary Containment Purge	2-in. Ball
V-106	Effluent Tank Bypass (underground)	N/A
V-107	UV #1 Drain	1/2-in. Ball
V-108	Recirculation Isolation	2-in. Ball
V-109	UV #2 Drain	1/2-in. Ball
V-110	Makeup Water	2-in. Ball

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VALVE NO.	DESCRIPTION	TYPE
V-111	Inlet H ₂ O ₂ Rotameter 1	1/2-in. Gate
V-112	Inlet H ₂ O ₂ Rotameter 2	1/2-in. Gate
V-113	Inlet H ₂ O ₂ Rotameter 3	1/2-in. Gate
V-114	Outlet H ₂ O ₂ Rotameter 1	1/2-in. Ball
V-115	Outlet H ₂ O ₂ Rotameter 2	1/2-in. Ball
V-116	Outlet H ₂ O ₂ Rotameter 3	1/2-in. Ball
V-117	T-210 Recirculation Isolation	2-in. Ball
V-118	IX Feed Camlock	2-in. Ball
V-119	PSIG IX-1 Purge	1/4-in. Ball
V-120	PSIG IX-2 Purge	1/4-in. Ball
V-121	PSIG IX-2 Purge (no gauge)	1/4-in. Ball
V-122	PSID IX-2 Purge	1/4-in. Ball
V-123	PSID IX-3 Purge	1/4-in. Ball
V-124	PSIG IX-3 Purge	1/4-in. Ball
V-125	PSIG IX-4 Purge	1/4-in. Ball
V-126	PSIG UV #1	1/2-in. Ball
V-127	PSIG UV #2	1/2-in. Ball
V-128	Gamma Detection Isolation	2-in. Ball
V-129	Recirculation Purge	1-in. Ball
V-130	IX-2 Effluent Isolation	2-in. Ball
V-131	IX-4 Effluent Isolation	2-in. Ball
V-132	T-204 Clean Water Line Sample Port	1/4-in. Sample Cock
HV-107	Sump Pump Discharge	2-in. Ball
HV-108	Sump Pump Discharge	2-in. Ball
HV-500	Recirculation From Effluent Storage Tanks	2-in. Ball
HV-501	Recirculation to UV	2-in. Ball
HV-502	Recirculation to IX	2-in. Ball
HV-503	Recirculation	2-in. Ball
FV-7	Dilute Acid for T-210 Neutralization	1 1/2-in. Auto
FV-9	Acid Regenerant	1 1/2-in. Auto
FV-17	Dilute Caustic for T-210 Neutralization	1 1/2-in. Auto
FV-19	Caustic Regenerant	1 1/2-in. Auto
FV-1A	IX-1 Service Inlet	1 1/2-in. Auto
FV-2A	IX-1 Backwash Inlet	1 1/2-in. Auto
FV-5A	IX-4 Backwash Outlet	1 1/2-in. Auto
FV-8A	IX-1 Fast Rinse Inlet	2-in. Auto

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VALVE NO.	DESCRIPTION	TYPE
FV-10A	IX-1 Fast Rinse Outlet	2-in. Auto
FV-11A	IX-1 Air Scour Inlet	1 1/2-in. Auto
FV-12A	IX-1 Subsurface Wash Inlet	1 1/2-in. Auto
FV-13A	IX-1 Air Scour Outlet	1-in. Auto
FV-1B	IX-1 Outlet/IX-2 Service Inlet	1 1/2-in. Auto
FV-2B	IX-2 Backwash Inlet	1 1/2-in. Auto
FV-3B	IX-2 Acid Regenerant/Settler Rinse Inlet	1 1/2-in. Auto
FV-4B	IX-2 Outlet	1 1/2-in. Auto
FV-5B	IX-2 Backwash Outlet	1 1/2-in. Auto
FV-6B	IX-2 Spent Regenerant Outlet	1 1/2-in. Auto
FV-8B	IX-2 Fast Rinse Inlet	2-in. Auto
FV-10B	IX-2 Fast Rinse Outlet	2-in. Auto
FV-11B	IX-2 Air Scour Inlet	1 1/2-in. Auto
FV-12B	IX-2 Subsurface Wash Inlet	1 1/2-in. Auto
FV-13B	IX- Air Scour Outlet	1-in. Auto
FV-1C	IX-2 Service Outlet/IX-3 Service Inlet	1 1/2-in. Auto
FV-2C	IX-3 Backwash Inlet	1 1/2-in. Auto
FV-3C	IX-3 Acid Regenerant/Settler Rinse Inlet	1 1/2-in. Auto
FV-5C	IX-3 Backwash Outlet	1 1/2-in. Auto
FV-6C	IX-3 Spent Regenerant Outlet	1 1/2-in. Auto
FV-8C	IX-3 Fast Rinse Inlet	2-in. Auto
FV-10C	IX-3 Fast Rinse Outlet	2-in. Auto
FV-11C	IX-3 Air Scour Inlet	1 1/2-in. Auto
FV-12C	IX-3 Subsurface Wash Inlet	1 1/2-in. Auto
FV-13C	IX-3 Air Scour Outlet	1-in. Auto
FV-1D	IX-3 Service Outlet/IX-4 Service Inlet	1 1/2-in. Auto
FV-2D	IX-4 Backwash Inlet	1 1/2-in. Auto
FV-3D	IX-4 Caustic Regenerant/Settler Rinse Inlet	1 1/2-in. Auto
FV-4D	IX-4 Service Outlet	1 1/2-in. Auto
FV-5D	IX-4 Backwash Outlet	1 1/2-in. Auto
FV-6D	IX-4 Spent Regenerant Outlet	1 1/2-in. Auto
FV-8D	IX-4 Fast Rinse Inlet	2-in. Auto
FV-10D	IX-4 Fast Rinse Outlet	2-in. Auto
FV-11D	IX-4 Air Scour Inlet	1 1/2-in. Auto
FV-12D	IX-4 Subsurface Wash Inlet	1 1/2-in. Auto

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VALVE NO.	DESCRIPTION	TYPE
FV-13D	IX-4 Air Scour Outlet	1-in. Auto
HVA-201	Influent From French Drain to T-201	2-in. Ball
HVB-201	Effluent From T-201	2-in. Ball
HVA-202	Influent From French Drain to T-202	2-in. Ball
HVB-202	Effluent From T-202	2-in. Ball
HVA-203	UV Effluent to T-203	2-in. Ball
HVB-203	IX Feed From T-203	2-in. Ball
HVA-204	Regenerant Effluent to T-204	2-in. Ball
HVB-204	Regeneration Clean Water From RFP	2-in. Ball
HVC-204	Regeneration Clean Water to P-3	2-in. Ball
HVA-205	Plant Effluent/T-205 Influent	2-in. Ball
HVB-205	T-205 Discharge	4-in. Butterfly
HVC-205	T-205 Recirculation	4-in. Butterfly
HVA-206	Plant Effluent/T-206 Influent	2-in. Ball
HVB-206	T-206 Discharge	4-in. Butterfly
HVC-206	T-206 Recirculation	4-in. Butterfly
HVA-207	Plant Effluent/T-207 Influent	2-in. Ball
HVB-207	T-207 Discharge	4-in. Butterfly
HVC-207	T-207 Recirculation	4-in. Butterfly
HVD-207	T-207 Isolation	2-in. Ball
HVA-208	Caustic Inlet-Truck Dock	2-in. Ball
HVB-208	Caustic Outlet-T-208	2-in. Ball
HVA-209	Acid Inlet-Truck Dock	2-in. Ball
HVB-209	Acid Outlet-T-209	2-in. Ball
HVA-210	P-210 Inlet	2-in. Ball
HVB-210	P-210 Outlet	2-in. Ball
HVC-210	Discharge Camlock	2-in. Ball
HVD-210	Discharge Truck Dock	2-in. Ball
HVA-301	P-301 Inlet	2-in. Ball
HVB-301	P-301 Outlet	2-in. Ball
HVA-302	P-302 Inlet	2-in. Ball
HVB-302	P-302 Outlet	2-in. Ball
FCV-1	Fail Close Plant Effluent	1 1/2-in. Solenoid
FCV-2	Fail Close Recycle	2-in. Diaphragm
FCV-3	Collection Gallery Flow Control	2-in. Diaphragm
FCV-4	UV Effluent Control	1 1/2-in. Ball

APPENDIX 3

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**PEROXIDE DOSING CHART
FOR USE WITH 50% H₂O₂**

Peroxide Dose (mg/l)	Water Flow Rate (gpm)	H₂O₂ Volume Flow Rate (ml/min)
50	10	2.64
	15	3.95
	20	5.28
	25	6.60
	30	7.92
75	10	3.96
	15	5.93
	20	7.92
	25	9.90
	30	11.88
125	10	6.60
	15	9.90
	20	13.20
	25	16.50
	30	19.80
150	10	9.92
	15	11.86
	20	15.84
	25	19.80
	30	23.76
175	10	9.24
	15	13.83
	20	18.48
	25	23.10
	30	27.72
200	10	10.56
	15	15.80
	20	21.12
	25	26.40
	30	31.68

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BUILDING 891 UV/H2O2 TREATMENT LOG

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